COLLABORATIVE LEARNING WITH THINK -PAIR - SHARE TECHNIQUE

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Abstract

Today is a knowledge age so that world needs to become a more richer palace for everyone. Students can learn their lectures and students can do their exercises on the web as individually or collaboratively with their peers like directed by the teacher by using the think-pair-share technique. The system provides the ability to clear to decide on their choices about the questions. The K-means clustering method is used to modify the pair state and support for determining students' grade of classes. The main objective of this study is to design a model for java programming learning system that facilitates the collaborative learning activities in a virtual classroom.

Keywords

Cooperative, Education, K-means, Learning, Teaching

1. Introduction

The usage of computers becomes a portal for variety of educational activities in which collaboration among the lecturers and students. Communication deals with communities of education which involves students, teachers. The learning method, Collaborative Learning is an essential method that has facilitated the students to work in group with each other to have their common academic goal.

The K-means method is evaluated the number of students with their related groups to participate the collaborative learning of the courses.

Think, Pair and Share is the activity prompts pupils to reflect on an issue or problem and then to share that thinking with others. Pupils are encouraged to justify their stance using clear examples and clarity of thought and expression. Pupils extend their conceptual understanding of a topic and gain practice in using other people's opinions to develop their own. Therefore, the idea of the system is to get collaborative learning java course by using the strategy of (TPS) and K-means clustering methods is help the system to get the automated students groups. And then the student marks will be shared within their groups by using their basic marks levels.

DOI : 10.5121/caij.2015.2101

2. Background Theory

2.1. Collaborative Learning

Collaborative learning (CL) provides an environment to enliven and enrich the learning process [1].

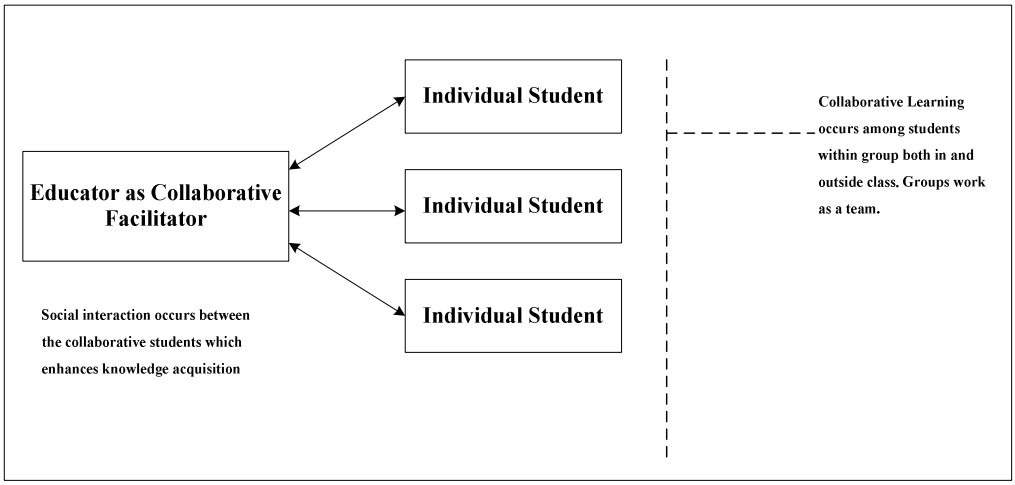

Figure 1. Collaborative Learning Architecture

During the collaborative learning, proper communication and interaction among peers allow CL features that must focus on the synchronous and asynchronous tools. In addition, the document management should be considered as well. With the above discussion, the following Table 1 describes the features of collaborative learning [2].

Table 1. Collaborative Learning Features

CL Features	Supporting Tools	
Synchronous Tools	- Audio Conferencing - Video Conferencing - Instant Messaging	- Web Conferencing - Chat - Whiteboards
Asynchronous Tools	- Discussion boards - Links - Email	- Calendar - Group Announcements - Survey and Polls
Document Management	- Resource Library	- UpLoad/ DownLoad

2.1.1. Computer Support Collaborative Learning (CSCL)

Collaborative learning should be supported by a specific tool that is closely related to Computer-Supported Collaborative Learning (CSCL). A CSCL tool which supports the collaborative activities among teachers and students were developed. And it is named as CETLs; Collaborative Environment for Teaching and Learning (system). CETLs applied the Think-Pair-Share technique which allows the users (both teacher and students) to communicate and collaborate together, using the three stages of the selected collaborative technique; think, pair and share [2].

2.2. Collaborative Techniques for Learners

Collaborative Learning makes students to learn more intensely their education and to think about their interest fields and to apply variety of settings.

There are many techniques available for collaboration. Some of the collaborative techniques are:

- Fishbowl
- Jigsaw
- Paired Annotations
- Think-Pair-Share

2.2.1. Fishbowl Technique

The first technique is Fishbowl which is also known a strategy in somewhere such as classrooms and business meetings because of providing for not only a richer discussion but also community to focus on the ways in which particular groups participate with their groups. Fishbowl is one of the collaborative learning strategies [3].

The Fishbowl offers the class an opportunity to closely observe and learn about social interactions. You can use it in any content area. This is a cooperative-learning structure for a small-group discussion or a partner discussion [4].

2.2.2. Jigsaw Technique

Each small group works on some aspect of the same problem, question, or issue. Jigsaws facilitate the group like the subgroups related with overall. It is needed to define to contribution of topic if a Jigsaw has been applied [5].

Jigsaw is used as an efficient means to learn new materials. This process encourages listening, engagement, and understanding by allowing each member of the group a critical part to play in the academic process [3]. The jigsaw strategy also makes people who administrate a system to develop the goal how to divide and shuffle students' group dynamically.

2.2.3. Paired Annotations

In Paired Annotations, two students compare their personal impression or commentary on an article, story, or chapter. Students may be pair again and again to answer the same article, chapter or content area so that students explore important facts and search for similarities and dissimilarities about them [2].

2.2.4. Think-Pair-Share

This is a four-step discussion strategy which incorporates wait time and aspects of cooperative learning [3]. Group members think about a question/topic individually, and then share their thoughts with a partner. Large group summarized sharing also occurs[4]. This technique will be describe next section.

2.3. Think-Pair-Share Techniques for Learning

The technique provides to make discussion and sharing of individual's opinions and ideas. The Think-Pair-Share method may take some practice [1].

CETLs stands for Collaborative Environment for Teaching and Learning (system). It is an educational system which is purposely developed for schools to support collaborative activities among teacher and students. In order to realize the collaborative process, CETLs applies Think-Pair-Share technique for the teaching and learning process [2].

The ideas of Think-Pair-Share technique are concluded based on the study made from [6] and [7], which is summarized in the following Table 2.

Table 2. Summary of the Think-Pair-Share

	Description
What?	Think-Pair-Share; a collaborative learning technique
Why?	To increase participation by allowing a group of collaborators to interact and share ideas, which can lead to the knowledge building among them.
How?	Consist of three stages: Think – Individually Each participant thinks about the given task. They will be given time to jot down their own ideasor response before discussing it with their pair. Then, the response should be submitted to the supervisor/ teacher before continue working with their pair on the next (Pair) stage. Pair – With partner The learners need to form pairs. The supervisor / teacher need to cue students to share their response with their partner. Each pair of students will then discuss their ideas about the task, and their previous ideas. According to their discussion, each pair will conclude and produce the final answer. Then they need to move to the next (Share) stage. Share – To all learners / collaborators The learners pair to share their results with the rest of the class. Here, the large discussion will happen, where each pair will facilitate class discussion in order to find similarities or differences towards the response or opinions from various pairs.

Think-Pair-Share technique is chosen to be applied in CETLs due to some reasons [6]. It is a learning technique that provides processing time and builds in wait-time which enhances the depth and breadth of thinking [7]. Using a Think-Pair-Share technique, students think of rules that they share with partners and then with classmates in a group [6]. Therefore, it is pertinent to apply this collaborative technique in CETLs.

2.4. Clustering

Clustering is a division of data into groups of similar objects. It models data by its clusters. Data modeling puts clustering in a historical perspective rooted in mathematics, statistics, and numerical analysis. Many types of clustering used in data mining as shown in the following:

- Hierarchical Clustering
- Linkage Metrics
- Hierarchical Clusters of Arbitrary Shapes
- Binary Divisive Partitioning
- Other Developments
- Partitioning Relocation Clustering
- Probabilistic Clustering
- K-Medoids Methods
- K-Means Methods
- Density-Based Partitioning
- Density-Based Connectivity
- Density Functions
- Grid-Based Clustering
- Co-Occurrence of Categorical Data
- Other Clustering Techniques
- Constraint-Based Clustering
- Relation to Supervised Learning
- Gradient Descent and Artificial Neural Networks
- Evolutionary Methods

Clustering is a division of data into groups of similar objects. Data modeling puts clustering in a historical perspective rooted in mathematics, statistics, and numerical analysis [8].

2.5. Selection of Initial Means

Typically improvement of clustering is upgraded for user how to select in terms of selection of initial means. Because these initial means are inputs of K-means algorithm, there are not independent of K-means clustering,. Some people want to select initial means randomly from the given dataset but others are not. The selection of initial means affects the execution time of the algorithm as well as the success of K-means algorithm. Certain strategies make to gather better results with the initial means.

In the simplest form of these strategies, K-means algorithm with different sets of initial means is planned and then taking and choosing the best results deriving from the initial mean. When dataset is considerable large and especially for serial K-means, this strategy is severe feasible. Another strategy gathering better clustering results is to revise initial points method. There are number of iterations to be closer to final K- mean from begin mean in possible case.

2.6. K-Means Clustering Algorithm

The idea, K-Means Clustering algorithm needs to divide in to different groups such as K clusters within the given data set by defining the fixed- value of K.

There are four steps:

1. Initialization for algorithm

Define number of clusters and the centroid for each cluster.

2. Classification the Group

Calculate the distance for each data point with minimum distance from the centroid.

3. Centroid Recalculation
The centriod will be repeatedly calculated.
4. Convergence Condition
Stopwhen a threshold value is achieved.
5. If all of the above conditions do not meet, then go to step 2 and the whole process repeat again, while the given conditions meet [9].

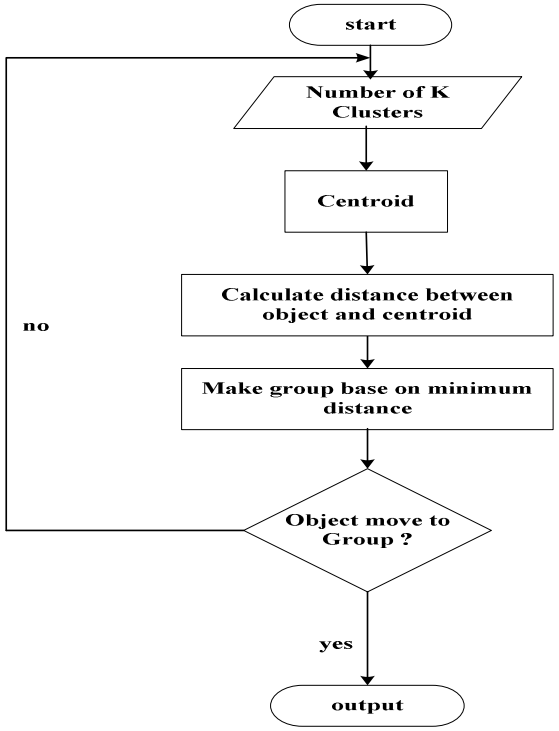

Figure 2. Flow Chart Diagram of K-mean

In Figure 2, According to the algorithm k objects are selected as initial cluster centres, then the distance between each cluster centre and each object are needed to calculate and to assign it to the nearest cluster, to update the averages of all clusters, to repeat this process until the criterion function converged. We define Square error criterion for clustering x_{ij} , the sample j of i-class, the center of i-class, and the number of samples i-class, in fig. 1 [10].

$$E = \sum_{i=1}^{k} \sum_{j=1}^{n_i} \left| x_{ij} - m_i \right| \qquad (1)$$

We define K-means clustering algorithm as follows:

Step 1: Input: N = objects
cluster ={x_1, x_2 ,...,x_n};
k= the number of clusters.
Step 2: Output: k = clusters;
with the sum of dissimilarity between each object;
its nearest cluster center is the smallest.
Step 3: Arbitrarily select

k objects as initial cluster centers with m_1, $m_{2,}$...,m_k;

Step 4: Calculate the distance between each object x_i;

Calculate each cluster center;

then assign each object to the nearest cluster, formula for calculating distance as:

$$dist(\mathbf{x_i}, \mathbf{m_i}) = \sqrt{\sum_{j=1}^{d} (x_{i1} - m_{j1})} \quad (2)$$

i = 1,2,...,N

j = 1,2,...,k

d (x_i, m_j) is the distance between data i and cluster j;

Step 5: Calculate the mean of objects in each cluster as the new cluster centers,

$$m_i = \frac{1}{N_i} \sum_{j=1}^{N_i} x_{ij} \quad (3)$$

i=l, 2,...,k; N_i is the number of samples of current cluster i;

K-mean clustering is simple and flexible. And also K-mean clustering algorithm is easy to understand and implements. Here the user needs to specify the number of cluster in advanced. Because of K-mean clustering algorithm's performance depending on a initial centroids, the algorithm provides no guarantee for optimal solution [11].

3.Design and Implementation

3.1. System Flow Diagram for Admin

In Figure 3, the admin or head are checked their validation such as name and password by system. If the admin can pass the checking process of the system, he/she can make many processes for the collaborative learning. After preparing exam, the admin makes the process of specify exam date. Admin allows students to answer to the questions and group the students with their education in their profile by using K- Means algorithm.

The admin can also view the students' exam information. The pairing stage has two steps. In the first step, admin chooses a number of students' group to answer them. The second step calculates the grade with results of students' examinations. According to Think- Pair- Share technique, admin shares the students' marks or grades for their group to know their conditions and what are needed to study about Java programming. This section provides students how to learn and how to promote their knowledge related Java Programming language. Admin needs to insert the questions for lessons whatever he/she let to learn to students. In this system, we describe Java programming as a example.

In short, there are four functions in admin section:

1. View Student Information
2. Specify Exam Date
3. Insert Questions
4. Group Students.

Our system aims at learning environment to be easy to learn about many fields. A person who has responsibilities for teaching can change to any educational fields like Medicine, Engineering, Economics and others. Admin always stores students' information in database to specify the

group and evaluate the performance of the students. And then he/she shows the results of students after they answered questions. Also admin needs to insert the questions periodically.

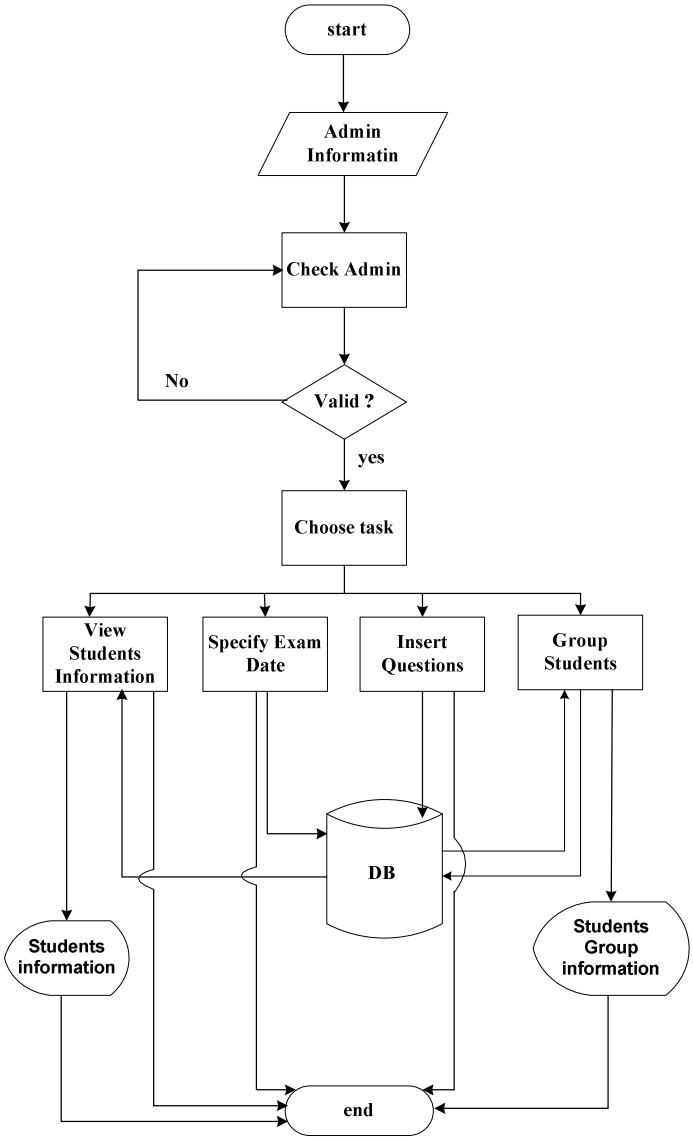

Figure 3. System Flow Diagram for Admin/ Head

3.2. System Flow Diagram for Student

In Figure 4, the student is needed to check their validation such as name and password. If the student can pass the checking process of the system, he/she can answer the exams. But the examination date has already specified by the admin. The student is needed to fill his/her profile. On the specify exam date the student can answer the examinations.

If there is no any exam date, the student cannot answer the questions. After the student finished the basic exam, he/she cannot continue to advance level without passing the basic exam. The

student can answer advance level questions when he/she passes basic level exam. Finally the students can see their group's information and grades from share student's information.

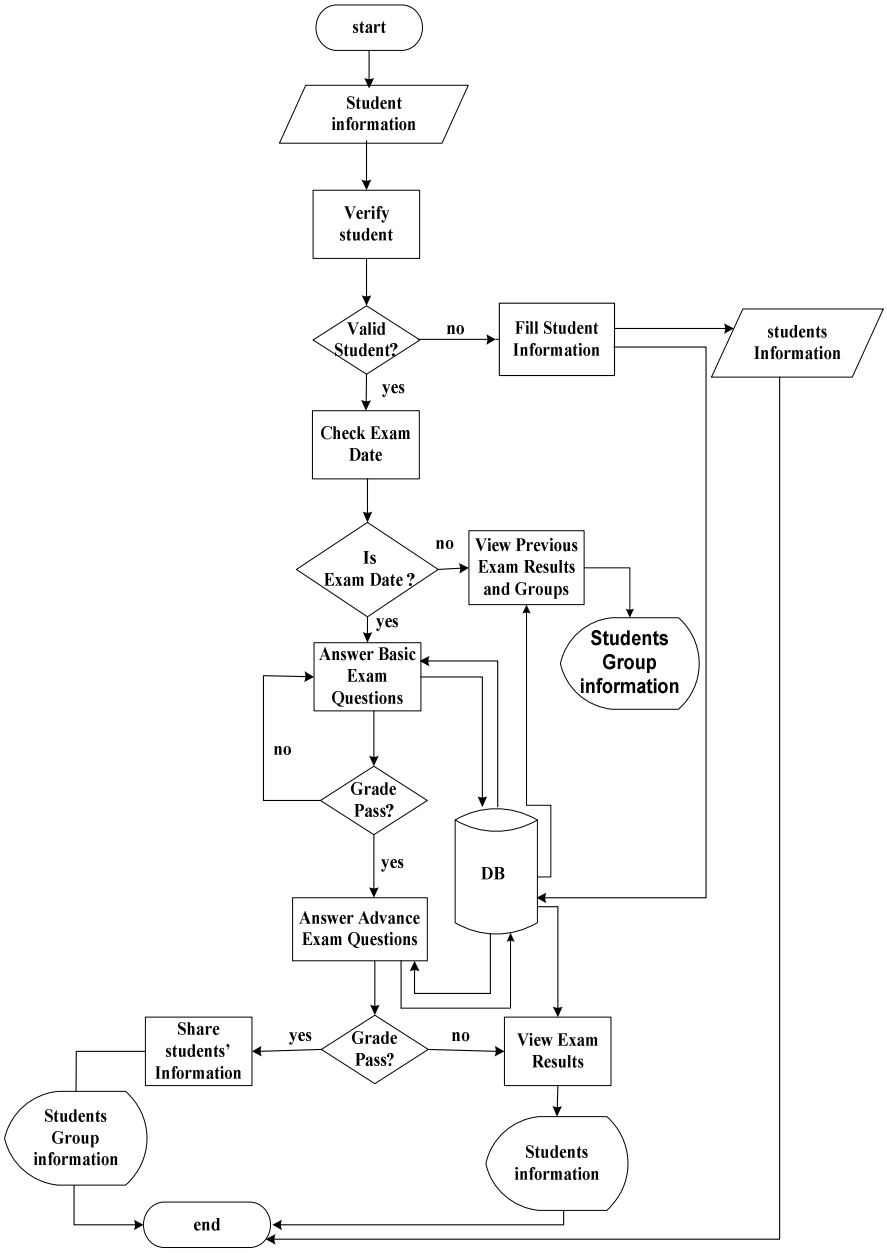

Figure 4. System Flow Diagram for Students

3.3. Database Diagram for Collaborative Learning

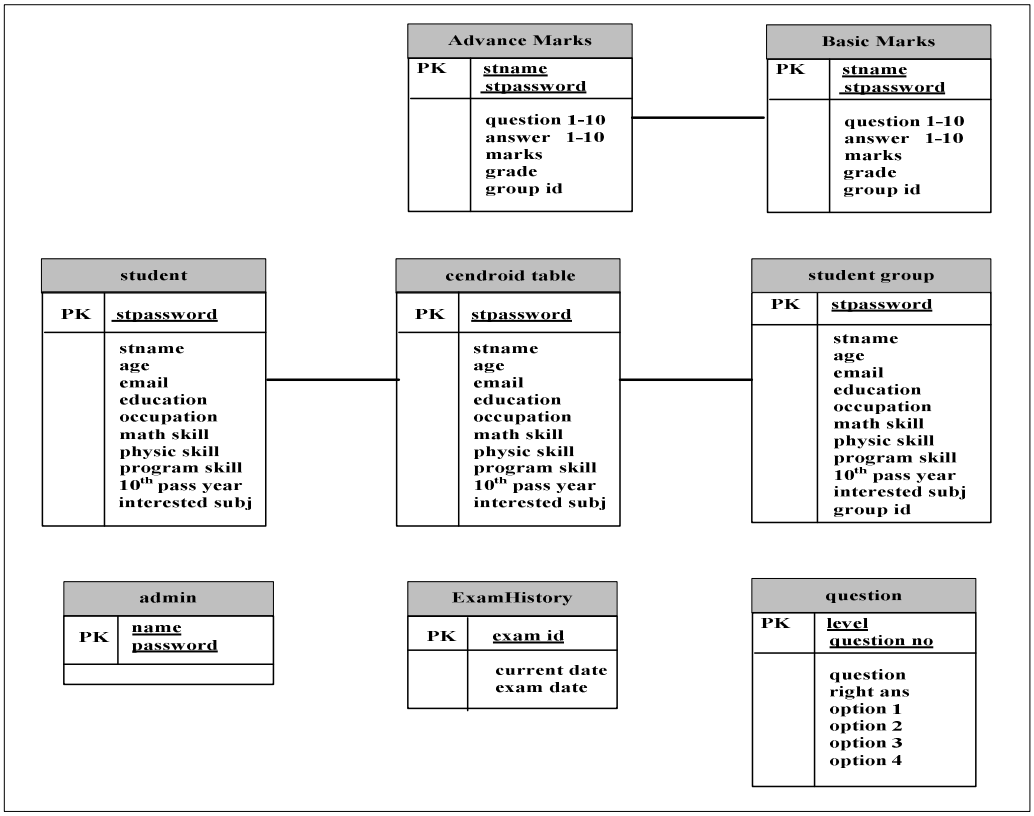

Figure 5. Database diagram for Collaborative Learning

4. Conclusion

This system aids the students in order to promote active learning in computer based learning environment. Our system can be a more simplicity and more suitability by using well-known collaborative learning technique, the “Think-Pair-Share”. This system can provide the benefits to specify the grades and group of the students by using K-mean clustering algorithm. The goal is to support as a learning tool by using computer-based systems.

Acknowledgements

Our heartfelt thanks go to all people, who support us at the University of Computer Studies, Mandalay, Myanmar. This paper is dedicated to our parents. Our special thanks go to all respectable persons who support for valuable suggestion in this paper.

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